

Chapter 4 - Defining the Scope of the Kawkawlin Watershed Plan

Goals for the Kawkawlin River Watershed

The Stakeholders group and the subcommittees have used reports generated by the DNRE and various consultants along with past studies and the results of the inventory of the Kawkawlin Watershed to determine goals for the watershed or to strengthen the goals that have been presented through the years. The goals are related to each of the impaired or threatened uses of the Kawkawlin River and are based on the reduction or elimination of pollutants that are mostly nonpoint source in origin. The goals have been developed on a watershed wide scheme and prioritized by the members of the various subcommittees. The overall goal is for the restoration or protection of the designated uses of the Kawkawlin River. The goals are as follows:

- Provide and improve water recreation opportunities and public access to the river
- Determine causes and correction of sediment loading in the river
- Protect and improve habitat and conditions for other aquatic life and wildlife along the river
- Provide for flood management
- Protect and improve the warmwater fisheries and conditions for the river system
- Identify and protect quality natural features including forested areas, floodplains, wetlands, riparian buffers and contiguous greenway buffers
- Preserve rural character (farmland and open spaces) of the watershed
- Maintain and/or increase the aesthetics of the water resources for human appreciation and use

Objectives for the Kawkawlin River Watershed Goals

Each goal will be met by a series of short-term, measurable objectives that will be based on addressing the causes identified as the sources of pollution either direct or nonpoint sources. Ultimately the attainment of the goals and objectives of the Kawkawlin Watershed Management plan will be accomplished through the process of adaptive management. As changes in the watershed occur over time and programs and BMPs are assessed for their effectiveness, the strategies to attain the watershed goals and objectives are likely to change over time and will need to be periodically reassessed and revised. Stakeholders and subcommittee members have had an opportunity to review the objectives. In Table 4.1, on the following pages, the pollutants were prioritized based on their impairment and the ability to reduce the pollutant to either a recommended level or a desirable level based on the knowledge available at this time. The pollutants that are known (K) or possible (P) are labeled throughout the table. As the table is reviewed, it will be noted that prioritization is provided three times in order to develop a better ranking of the pollutant or degree to which the pollutant is felt to impact the watershed. The overall affect of the pollutant and how easily the pollutant moved from its source into the river was considered during the ranking process.

Table 4.1 – Goals and Objectives

Priority	Designated Uses	Goals	Priority	Pollutants and Impairments to Designated Uses (P) = Possible (K) = Known	Priority	Sources (P) = Possible (K) = Known	Causes	Objectives
	Partial and Total Body Contact Recreation	Restore and protect surface water for partial and total body contact		Pathogens (<i>E. coli</i>) (K)		Livestock (K)	Unlimited livestock access; lack of manure storage; runoff from land near drain or river	Exclude livestock from stream; follow manure application rates; work topical manure application into soil; construct waste storage systems; education of hobby farms with domestic animals.
						Faulty onsite treatment systems (K)	Leaking, poorly maintained, failing, and over capacity septic systems	Determine location of failing systems; Develop a program to identify and replace failing systems; Identify districts where sanitary main extensions are possible; Encourage proper installation and maintenance of septic systems; educate public concerning septic treatment system maintenance
						Municipal wastewater (P)	Poorly maintained, leaking sanitary sewer systems	Repair/replace municipal wastewater system; minimize discharges and sanitary sewer overflows
						Storm Water Drainage Systems (P)	Anthropomorphic and natural sources	Continues IDEP program implementation in municipal areas; Perform IDEP screening during drain maintenance activities as "sewage" can be controlled in PA 40 (put in section); education of the public; use of vegetation. Filter and store runoff by maintaining natural landscape processes.
						Wildlife (P) examples; water fowl, deer, raccoons, muskrats, other mammals	Overpopulation in open areas	Control water fowl and other mammal populations
						OTHER????		
				Sediment (Turbidity) (K)		Stream bank erosion (K)	Fluctuating hydrology	Stabilize drain flows to moderate hydrology; reduce suspended solids; prevent sediments from being transported out of drains into river; maintain the floodplain
						Urbanized area sheet and rill erosion when soils are exposed or sediment in runoff from impervious surfaces (K)	Urbanized sheet and rill erosion, exposed soils with no BMPs in place	Maintain pervious surfaces and encourage infiltration. Filter and store runoff by maintaining natural landscape processes; Reduce public costs associated with runoff treatment, flood protection and air quality.
						Channelization (P)	Straightening of waterways; channel improvements	Reduce suspended solids; implement low flow channel and vegetated shelves. Use recent aerial photos to determine areas where flow impediments can create channelization and use "green" channel restoration methods to correct.
						Livestock (K)	Unrestricted livestock access	Exclude livestock from drains/tribs; education of domestic animal owners
						Construction and development (K)	Lack of SESC practices and enforcement	Reduce suspended solids from construction sites; Filter and store runoff by maintaining natural landscape processes.
						Agricultural sheet, rill, and gully erosion (K)	Conventional tillage; plowing up to edge of drains or tribs at surface outlets, surface drainage of fields, lack of vegetated buffers, lack of flexibility of buffer programs	Encourage cover crops and reduced tillage; Implement programs to promote grassed waterways, variable width buffers, windbreaks; Education of hobby farm owners; Assist Farm Bureau with outreach programs
						OTHER??		
				Nutrients (K) (Algal Blooms)		Urbanized area practices (K)	Over-fertilization of lawns and vegetated properties; lack of riparian buffer; faulty onsite treatment systems (K)	Establish vegetated filter strips or other riparian buffer; educate the public on proper disposal of yard waste; educate public on lawn care practices and fertilizing; encourage proper installation and maintenance of onsite treatment systems; Continue implementation of a phosphorus ban on commercial lawn fertilizers; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for storm water
						Agricultural practices (K)	Over-fertilization of fields; lack of riparian buffer; livestock in streams	Identify livestock operations on drains/tribs; establish filter strips or other riparian buffer; increase canopy cover on drains/tribs; encourage reduced tillage practices; exclude livestock from drains/tribs; Determine if wildlife is source of problems in specific areas; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for agriculture. Education of hobby farms on manure management for domestic animals (use of program developed in Huron County)

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Priority	Designated Uses	Goals	Priority	Pollutants and Impairments to Designated Uses	Priority	Sources	Causes	Objectives
						Sediment Deposition areas (P)	Phosphorus and other nutrient recycling from sediment during anoxic conditions	Identify sediment deposition with high concentrations of nutrients; Research how to remove excessive sediment; implement actions to remove excessive nutrients; Filter and store runoff by maintaining natural landscape processes to address nutrient loads.
	Partial and Total Body Contact Recreation	Restore and protect surface water for partial and total body contact		Pesticides & Herbicides (P)		Urbanized Area practices (P)	Improper pesticide/herbicide application and no calibration; impervious surface runoff from improper application	Installing riparian buffers such as filter strips; grassed waterways; Education on proper use; Assure applicators are properly trained
						Agricultural practices (P)	Improper pesticide/herbicide application and calibration; leaching; runoff	Increase of farms using Integrated Pest Management; installing riparian buffers such as filter strips; grassed waterways; Education of hobby farm owners; Use of professional ag applicators from Co-ops and elevators
						OTHER?		
	Other Indigenous Aquatic Life and Wildlife	Restore and protect surface water for indigenous aquatic life and other wildlife		Loss of Habitat (K) (Wetlands and Fragmentation)		Creation of private ag drains / county drain maintenance (P)	Channelization to drain wetlands	Net gain of wetland acres; utilization of buffers
						Agricultural practices (K)	Wetlands drained for agriculture	Net gain of wetland acres; utilization of buffers; education of property owners
						Urbanized area expansion (K)	Wetlands filled for development	Net gain of wetland acres; utilization of buffers; education of property owners
				Nutrients (K)		Urbanized area practices	Over-fertilization of lawns, parks and other vegetated properties; lack of riparian buffer; faulty onsite treatment systems	Continue implementation of a phosphorus ban on commercial lawn fertilizers; Establish filter strips or other riparian buffer; educate the public on proper disposal of yard waste; encourage proper installation and maintenance of onsite treatment systems; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for storm water. Filter and store runoff by maintaining natural landscape processes to help removal of nutrients.
						Agricultural practices	Over-fertilization of fields; lack of riparian buffer; livestock in streams	Identify livestock operations adjacent to rivers; establish filter strips or other riparian buffer; increase canopy cover; reduce tillage; exclude livestock from stream; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for agriculture
				Pesticides & Herbicides (P)		Urbanized area practices	Improper pesticide/herbicide application and no calibration; impervious surface runoff from improper application	Installing riparian buffers such as filter strips; grassed waterways; Education on proper use; Assure applicators are properly trained. Filter and store runoff by maintaining natural landscape processes.
						Agricultural practices	Improper pesticide/herbicide application and calibration; leaching; runoff	Increase of farms using Integrated Pest / weed Management; installing riparian buffers such as filter strips; grassed waterways; Education of hobby farm owners; Use of professional ag applicators from Co-ops and elevators
	Warmwater Fishery	Restore and protect surface water as warmwater fishery		Low Base Flow (K) (Temperature)		Altered or Modified hydrology, drain modifications, naturally occurring	Re-directed stream flow; irrigation; low precipitation or low lake levels; lack of vegetative cover	Conduct hydrologic assessment prior to modifying drain hydrology or re-directing stream flow; increase tree canopy. Encourage projects that improve hydrology in the watershed. Use recent aerial photos to determine where blockages or split flow or hydraulic inhibitions exist and intervene with natural methods to correct flow problems.
				Invasive Species vegetative (k)		Phragmites, Canary grass, purple loosestrife etc.	Introduced from various sources on the Great Lakes shoreline and have moved up the coastal regions of Lake Huron; have various transmission vectors but are establishing themselves	Minimize the spread of these species; education of landowners on eradication

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Priority	Designated Uses	Goals	Priority	Pollutants and Impairments to Designated Uses	Priority	Sources	Causes	Objectives
	Warmwater Fishery	Restore and protect surface water as warmwater fishery		Nutrients (K) (Low Dissolved Oxygen)		Urbanized area practices	Over-fertilization of lawns, parks and vegetated properties; lack of riparian buffer; faulty onsite treatment systems	Establish filter strips or other riparian buffer and promote conservation easements; educate the public on proper disposal of yard waste and application of fertilizers; encourage proper installation and maintenance of onsite treatment systems; implement sanitary sewer projects where population can support action.
						Agricultural practices	Over-fertilization of fields; lack of riparian buffer; livestock in streams	Establish filter strips or other riparian buffer; increase canopy cover; reduce tillage; install livestock exclusion fencing; education of hobby farm owners; support Farm Bureau programs; develop efficient incentive programs for compliance strategies when areas show non-attainment
				Loss of Habitat (K) (Aquatic habitat)		Creation of new drains or implementing drain maintenance	Scouring of the stream bottom for drain maintenance removes stable natural habitat	Establish low flow channels and shelves when applicable; establish filter strips; build and restore banks to reduce sedimentation
						Urbanized area expansion	Influx of people building next to surface waterbodies and drainage systems and removing riparian canopy and undergrowth.	Install filter strips; establish forest or other appropriate vegetated buffers to increase shade canopy; education on riparian responsibilities and effects of practices on watercourses. Filter and store runoff by maintaining natural landscape processes. Provide a sense of place by connecting people to the nature, history, and culture of the watershed.
						Agricultural practices	Plowing up to edge of drains or tribs at surface outlets, surface drainage of fields, lack of vegetated buffers, lack of flexibility of buffer programs	Implement innovative buffer programs with incentives and concentration on surface outlets; Implement Farm Bureau programs; Education of hobby and non-attainment farm owners
				Removal/Lack of Food Sources (K)		Sediment loading	Erosion	Stabilize stream banks to reduce sedimentation; establish filter strips and vegetated surface outlets, improve programs for vegetated channels for storm water conveyance
						Minnow harvest	Unlicensed harvesters	Increased oversight and enforcement on harvesting volumes and frequencies
						Nutrients	Over-fertilization of urban green areas or ag fields; lack of vegetated buffer	Establish filter strips establish forest or other appropriate vegetated buffers to increase shade canopy; education on riparian responsibilities and effects of practices on watercourses; implement surface outlet BMPs to decrease sediment loading in drains; Implement Saginaw Bay Coastal Initiative Phosphorus recommendations for agriculture and storm water
						Pesticide loading	Improper pesticide application and calibration; leaching; runoff	Increase of farms using Integrated Pest Management or using ag applicators from local co-op or elevators; installing riparian buffers such as filter strips; grassed waterways; Education of urbanized area residents on proper applications.
	Navigation	Restore and protect surface water for navigation		Trash and Debris (K)		Log jams/snags in upper reach of South and North Branch	High flow events; Ice jams and blockages that move or create debris; stream bank erosion	Manage woody debris; stabilize stream banks; Continued managed clean up of Main Branch after major events (ice or water) or annual clean-up
						Petroleum Pipe river-crossings	Old petroleum pipeline crossings over the river;	Remove pipe crossings that are in navigable waters to prevent hydrocarbon spills
						Lack of maintenance	No designated entities responsible for removing obstructions and maintaining navigable waters; depositional areas in the river create nutrient deposits	Continue to manage debris; continues volunteer stream clean-up activities
						Dumping	General misunderstanding of how humans negatively impact the watershed by discarding trash; lack of signs or threat of enforcement	Hold an Annual River Clean-Up Day to remove trash from the river/streams/ditches; increase visibility of "No Dumping" signs; Education of county on detrimental effects of dumping in drains, tribs or river.
				Low Base Flow (K) Altered Hydrology		Modified Great Lake's hydrology; drain modifications; naturally occurring	Re-directed stream flow; irrigation; low precipitation or (high / low) lake levels	Conduct hydrologic assessment prior to modifying drain hydrology or re-directing stream flow; Determine if a project can increase baseflow.

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Priority	Designated Uses	Goals	Priority	Pollutants and Impairments to Designated Uses	Priority	Sources	Causes	Objectives
	Navigation	Restore and protect surface water for navigation		Sediment (K)		Wake action in Main Branch (K)	Fluctuating hydrology, wake action caused by boat traffic and naturally occurring	Minimal speed for boat traffic to reduce re-suspending solids and stirring up nutrients
				Obstructions (K)		Stream bank erosion	Fluctuating hydrology (k)	Stabilize stream flows to moderate hydrology, reduce suspended solids and maintain the floodplain
						Agricultural sheet, gully and rill erosion	Conventional tillage, plowing up to edge of stream (s)	Encourage cover crops and reduced tillage, as well as grassed waterways and windbreaks
						Channelization (P)	Straightening of waterways; channel improvements	Reduce suspended solids; implement low flow channel and vegetated shelves
						Livestock (K)	Unrestricted livestock access	Exclude livestock from drains/tribs; education of domestic animal owners
						Construction and development (K)	Lack of SESC practices and enforcement actions	Reduce suspended solids from construction sites; Utilize appropriate BMPs, Develop a civil infraction enforcement ability for SESC compliance
						Dumping	General misunderstanding of how humans negatively impact the watershed by discarding trash; lack of signs or threat of enforcement	Hold an Annual River Clean-Up Day to remove trash from the rivers/streams/ditches; increase visibility of “No Dumping” signs; Education of county on detrimental effects of dumping in drains, tribs or river.
				Access Sites (P)		Limited places to enter the upper reaches of the river	Much of the area is private property; not many access sites to the river	MDNRE develop access sites on conservation easements; connect a water trail to the Mouth of Kawkawlin; Implement Visions of Green as a connection

Pollutant Causes and Sources to be restricted

The causes and sources of the impairments or pollutants associated to the designated uses are acknowledged in Table 4.1. The prioritization by the stakeholders group and subcommittees of the sources that need to be constrained based on the inventory as presented in Chapter 3 and applying the information across the various subwatersheds because of similar land use, features and homogeneous nature of the mid and lower reaches of the watershed. The high priority subwatersheds have been identified where subsequent actions need to be concentrated for future results.

Final Water Quality Summary

The water quality summary describes the relationship between the current goals and objectives related to the designated uses and displays the pollutants, sources and causes as they are prioritized by the stakeholders group and subcommittees.

As outlined in the Saginaw Bay Remedial Action Plan (RAP), the Saginaw Bay has been identified as an Area of Concern for the Great Lakes and is in line for the Great Lakes Restoration Initiative funding. The Saginaw River/Bay RAP of 1988 cited 12 impairments of the 14 categories. Since that time, two impairments have been delisted. They are:

- Tainting of fish and wildlife flavor (taste and odor concerns) and
- Restrictions on drinking water consumption or taste and odor problems.

This still leaves 10 impairments in the Saginaw River/Bay AOC. The Kawkawlin River is a contributor of pollutants to the Saginaw Bay. By addressing the nonpoint source (NPS) issues of the watershed, this plan will also help with the water quality of the Greater Saginaw Bay. The areas where efforts will need to focus in the future and in this plan are the NPS issues of the Kawkawlin Watershed that contribute to the remaining 10 impairments listed for the Saginaw Bay and the complete list of 14 beneficial uses is listed below (the bulleted items that are in bold red text are the remaining impaired beneficial uses that must be addressed):

- **Restrictions on fish or wildlife consumption**
- Tainting of fish and wildlife flavor
- **Degradation of fish and wildlife populations**
- Fish tumors and other deformities
- **Degradation of fish and wildlife habitat**
- **Bird or animal deformities or reproductive problems**
- **Degradation of benthos (bottom dwelling organisms)**
- **Restrictions on dredging activities**
- **Eutrophication or undesirable algae (nuisance algal blooms, oxygen depletion, and nutrient loadings)**
- Restrictions on drinking water consumption, or taste and odor problems
- **Beach closings (exposure to waterborne human pathogens)**

- **Degradation of aesthetics**
- Added costs to agriculture and/or industry
- **Degradation of phytoplankton and zooplankton populations (minute aquatic plants)**

As noted in the inventory of various spots on the lower reaches of the Kawkawlin, the macro invertebrate community is generally poor to fair in most cases and rarely acceptable. The stream habitat since 2000 has been rated as severely to moderately impaired in the lower reaches and only slightly impaired in the upper reaches. The hydrology and land use (mostly agriculture) lends itself to runoff conditions that are not conducive to a healthy watershed. The farmers that are good stewards of their lands are outnumbered by those not instituting soil saving practices. There are elevated levels of phosphorus and total suspended solids (TSS). The watershed inventory did identify areas of sedimentation in the drains and in the river itself, eroding streambanks causing trees debris in many stretches, nutrient sources from agricultural fields and failing onsite treatment systems.

Impairments to Water Quality

Impairment – Pathogens (*E.coli*)

Description:

Escherichia coli (*E.coli*) has been an ongoing and increasing problem in the Kawkawlin Watershed. The KRWPOA and the Bay County Health Department (BCHD) has summarized and documented the problem for many years now by sampling at many locations. The sampling results have been above water quality standards at many times over the years and have forced beach closures and water contact warnings. Because the numbers of pathogenic organisms present in wastes and polluted waters are few and difficult to isolate and identify, the coliform organism, which is more numerous and easily tested for, is used as an indicator organism.

Sources:

E. coli is found in the digestive systems of warm blooded animals. The detection of *E.coli* in the water column can often indicate there may be a presence of other enteric forms of bacillus in the water which are harmful to humans and can cause waterborne disease such as diarrhea, vomiting, fever, jaundice and dysentery. Most of these pathogens cannot live for extended periods of time outside of the host organism, indicating that the source may be close by. Sources include waterfowl; domestic animals such as horses, dogs, cattle and cats; failing onsite treatment systems and wildlife, both dead and alive.

Causes:

Storm water runoff from areas where domestic livestock is located in proximity to the river or have access to the river can allow the pathogens a vector to pollute. The inventory of the agricultural areas did not indicate large feeding operations; however, a

significant amount of “hobby” farms were discovered to be in proximity to drains and the river.

As indicated in the record inventory completed by the BCHD, the median age of onsite treatment systems is 36 years. This is well beyond the useful life of such a treatment system; so failing, older onsite treatment systems are allowing pathogens to enter surface water and groundwater in areas where the soils are lighter and permeable.

Sanitary sewer maintenance can also be a cause for pathogens to enter into surface water and groundwater tables. The existing municipal and private wastewater systems that are on the river can be a source of the pathogens if treatment protocols are not followed well and if maintenance issues (leakage or overflow) cause the systems to fail in their proper operation.

Wildlife cannot be overlooked as a source; the waterfowl and deer populations have increased dramatically over the past two decades. The numbers of animals, especially waterfowl that can concentrate in areas almost year-round now, can be a substantial source of pathogens. Along with muskrat, raccoons, skunks and other “critters,” some of these species have begun to use storm sewers as shelter and dens and thus become a source of pathogens into surface water.

Priorities:

Pathogens can be the vector of many waterborne illnesses in humans and animals, consequently this is a high-priority impairment to the partial and total body contact recreation for the watershed. Also, by addressing this issue in the Kawkawlin River, this plan will be addressing the beneficial use impairment (BUI) for the Saginaw Bay related to beach closures.

Goal:

- Restore and protect the surface water for partial and total body contact recreation

Objectives:

- Eliminate all beach closures in the immediate area by the mouth of the Kawkawlin River
- Develop and implement a program for obtaining as close to “real-time” monitoring results on pathogens as possible to decrease beach closures incidents
- Implement a program to identify failing, leaking onsite treatment systems or detect direct connection through use of infrared or heat resolution aerial or land-based photography to eliminate pathogen vector to the surface water or groundwater
- Implement a program to replace and/or repair onsite treatment systems in areas identified by BCHD
- Complete categorization of record keeping function of BCHD for tracking onsite treatment systems

- Develop education programs for rural areas that address onsite treatment systems
- Develop and implement a program to inspect and certify existing onsite treatment systems at time of sale of real estate or when a system is constructed or reconstructed
- Develop and implement a record database system through BCHD to notify homeowners with existing onsite treatment systems of routine maintenance to be performed, with a confirmation ability of the maintenance
- Identify areas where sanitary sewer lines can be extended to address failing onsite treatment systems
- Develop or continue to adhere to a maintenance plan to repair or replace municipal sanitary sewer systems
- Control waterfowl and other domestic or wild mammals that can be a nuisance source of pathogens to surface water
- Implement a watershed-wide roadkill program to pick up and dispose of dead animals in an environmentally safe manner
- Provide education to the public on issues of pathogens in surface water

Impairment – Sediments

Description:

Excess sediment can create many problems for the surface water environment. It can cover the river or stream bed habitat necessary for macroinvertebrates. Also, sediment can cover the gravel beds necessary for fish reproduction or cover fish and amphibian eggs and destroy reproduction ability of the warmwater fishery and fringe wetland habitat. Deposition of large amounts of sediment as point bars, middle bars, tributary bars or alternate bars will impede navigation. Also, the suspended sediment creates turbidity; the suspended particles can absorb heat from sunlight making turbid waters even warmer thereby reducing the concentration of dissolved oxygen in the water. Some macroinvertebrates can't survive in the warmer water. Also, macroinvertebrate larvae are covered and suffocated and the gill structures of fish become clogged and damaged.



Sources:

Sediment is a naturally occurring material from weathering and erosion and is transported by the action of water, wind or ice. In the Kawkawlin watershed, it primarily originates from runoff from urbanized and rural areas. The watershed land use is predominately agricultural; so, at certain times of the year, the source is from adjacent fields, but can also be from sheet, rill and gully erosion at new construction sites and other urban pervious and impervious settings. The watershed inventory, windshield surveys and subcommittees identified areas of erosion, such as drains with gully and rill erosion, surface drains for agricultural fields transporting sheet erosion to point source discharges and drain, stream and river bank erosion, channelization, and tributary deposition. These are all to be considered as major sources or contributors to sedimentation.

Causes:

Anthropomorphic or natural activities that disrupt the riparian environment can cause erosion in the banks of the river or tributaries. For example, ice formation then the movement of ice as it melts creates bank erosion, or if an ice dam forms at downed trees in upper reaches or at crossings or bridges, the movement of water under the ice dam can erode the silty river bed or erode banks as water moves around the ice buildup. Conservation, no till or low tillage practices leave less soil exposed to wind and water erosion than conventional tillage practices. The construction practice of completely stripping vegetation from a site or use of properly maintained soil erosion and sediment control practices (SESC) on a site can contribute significant amount of sediment into storm systems and ultimately the river. Sediment transport from impervious surfaces into storm sewer systems without proper BMPs such as filtering systems, use of vegetated swale collection systems, infiltration practices or detention basins to settle out sediment particles create problems. Unrestricted access by livestock into rivers or drains can deteriorate the banks and lead to erosion of the bank. Wave action by boats or Saginaw Bay can move sediments at the mouth of the river to impede navigation or cause bank erosion at sites with no bank armoring in the main branch. The backwater effect of the Saginaw Bay can cause sediment loads to drop out of the water column in the upper reach of the Main Branch and create sediment banks. The sediment itself can cause a significant demand on the dissolved oxygen in the water column. Some of the major fluvial river environments for deposition of sediments include areas of a river that are braided, such as on the North Branch.

Priorities:

Sediment is a high priority to partial and total body contact recreation and low flow situations. This issue is a medium priority for navigation and warmwater fisheries on the North Branch and South Branch.

Goals:

- Restoration and protection of surface water for partial and total body contact by reducing sediment loading
- Restoration and protection of surface water for navigation by reducing sediment loading in the watershed
- Improve or restore the warmwater fisheries by reduction of sediment loading

- Improve or restore the aquatic environment by reduction of sediment loading
- Improve or restore base flow by reduction of sediment loads creating channel flow blockages in river and tributaries

Objectives:

- Develop or implement programs for cover crops to help prevent sedimentation
- Encourage and develop programs to provide education on cover crops and low/no till practices to targeted groups in rural setting
- Develop a program for cover crops for agricultural fields within 10%, 20% or 50% recurrence interval floodplain
- Stabilize river and tributary flows to moderate altered hydrology, increase baseflow, reduce TSS and maintain floodplain to prevent sedimentation
- Establish a filter strip program with shorter time commitments and adaptive techniques that will get more “buy-in” by the agricultural industry to improve the quantity of filter strips in place
- Implement programs to develop a green zone in riparian areas using the Vision of Green objectives and goals
- Implement a program to reduce sedimentation from channelization and channel improvements
- Install livestock exclusion fencing and livestock crossing on drains and tributaries or river
- Develop a civil infraction ordinance for the SESC program in Bay County
- Assure “No Wake” enforcement on the Main Branch
- Implement BMPs to address sediment collection or entrapment during drain maintenance activities
- Assess areas in river channel for sediment traps

Impairment – Nutrients

Description:

High levels of nutrients are a known issue in the Kawkawlin Watershed. These excess nutrients, especially phosphorus, can lead to eutrophication in the river and ultimately Saginaw Bay. The excess nutrients are already creating problems with excessive aquatic plant growth on the Main Branch. The South Branch has excessive algae growths in the channels and tributary drains indicating excess nutrients. There is a braided channel section of the North Branch that also has algae and aquatic plant growth east and west of the I-75 crossing called the White Bayou in 1905. During the night, when these plants cannot get light to carry out photosynthesis, they deplete oxygen from the water column rather than restore it to the water. The extreme growth rates fueled by nutrients create a situation that can deplete dissolved oxygen and many species of fish and other aquatic life cannot survive. The aquatic plant and algae organic matter dies and decays and increases the biological oxygen demand (BOD) leading to fish kills.

Sources:

The urban sources of nutrients are lawn clippings and leaf disposal in the river and tributary streams and drains. Residential lawn fertilizers and failing onsite treatment systems are a source. Domestic and wildlife wastes are also a nutrient source.

In rural areas, nutrient sources are livestock waste products, agricultural fertilizing both historical and misapplied or misinformed applications and manure applications to fields without consideration of surface runoff before incorporation into the soil.

The sediment in the channels of the tributary drains, streams and the river itself is a source of nutrient loading to the river's surface water. During anoxic cycles, the sediments will release phosphorus into the water column.

Causes:

In urbanized, areas the lawn clippings, leaves and mulch have high levels of phosphorus that enter the storm water drainage system by surface runoff during precipitation events or snowmelt. The residential lawns and other sources of turf grass such as parks, athletic fields, cemeteries and golf courses that maintain turf grass to the edge of the river or tributary stream or drain add nutrients to the surface water through runoff and infiltration. Failing or leaking onsite treatment systems are a source of nutrients. Waterfowl and domestic animals are a source of nutrients to surface water from their fecal waste.

The Saginaw Bay Coastal Initiative Phosphorus Committee Report of June, 2009, estimated that point sources of phosphorus in 1991 were 50% of the total. By the 2002 update of the Saginaw Bay RAP, it was noted that communities in the Saginaw Bay watershed had invested over \$700 million since 1972 to improve wastewater treatment and the point source loading were reduced by 80 - 90%. A more recent study using the SPARROW model showed point source loads from phosphorus at 29%.

In Non Point Source (NPS) loading by land use category, it has been determined that agricultural lands contribute about 0.55 lbs/acre, whereas commercial contributes about 0.79 lbs/acre and HD residential contributes 0.69 lbs/acre of phosphorus to the watershed.

In rural areas, domestic livestock can be a source of nutrients if their holding areas have surface drainage toward tributary drains, streams or the river itself. Misinformed agricultural growers can be a source of nutrients by adding concentrated amounts of nutrients to fields or misapplication to fields or applications done before a storm creating runoff.

The periods of anoxic water conditions that exist in the Kawkawlin River and some of its tributary streams are a cause of nutrient loading. Phosphorus is released into the water column from the sediment/water interface during anoxic periods. Efforts need to be made to either keep higher levels of dissolved oxygen in the water column or remove sources of nutrients from the river to prevent their release during periods of anoxia.

Priorities:

Nutrients are a high priority to partial and total body contact, warmwater fisheries and aquatic habitat. The nutrients are a low level priority to wildlife and riverside habitat.

Goals:

- Restore and protect surface water for partial and total body contact
- Restore and protect surface water for aquatic life and wildlife
- Restore and protect surface water for warmwater fisheries

Objectives:

- Implement a program to identify failing, leaking onsite treatment systems
- Implement a program to replace and/or repair onsite treatment systems in areas identified by BCHD
- Develop education programs for urban and rural areas that address onsite treatment systems
- Identify areas where sanitary sewer lines can be extended to address failing onsite treatment systems
- Control waterfowl and other domestic or wild mammals that can be a nuisance source of nutrients to surface water
- Identify livestock operations adjacent to river or tributaries
- Provide education to the property owners defined above on the issues of nutrients in surface water
- Educate the public on proper disposal of yard waste materials, no disposal in surface water or county or municipal storm systems
- Identify, educate and promote to the public the Vision of Green
- Educate and promote to the public the use of conservation easements
- Implement tasks to address issues of excessive nutrients and low DO in North Branch (White Bayou), excessive nutrients in Main Branch, excessive nutrients in South Branch
- Identify areas with high concentrations of nutrients in Main Branch and South Branch and North Branch and determine best removal methods to eliminate the loadings
- Implement nutrient removal methods in areas identified above
- Implement a nutrient monitoring program at tributary inlets to the river throughout the watershed for a two year period
- Use information from the above task to implement BMPs for nutrient removal from tributary streams and drains
- Implement BMPs to address nutrient collection or entrapment during drain maintenance activities
- Implement BMPs to increase DO in surface water in areas with historical low DO
- Educate agricultural industry on nutrient removal BMPs
- Implement education program on phosphorus for the urban public
- Implement a program in the watershed that discourages commercial and retail sellers of fertilizers from selling fertilizer with phosphorus without proof of need by the public (a soil test)

- Implement a program to have commercial or retail businesses provide a brochure when selling 10-10-10 or 12-12-12 fertilizers
- Continue to support the county wide phosphorus ban in Bay County and seek support from neighboring counties without such a ban
- Pressure state law makers to initiate statewide phosphorus ban
- Implement feasible portions of the *Saginaw Bay Coastal Initiative Phosphorus Committee Report (June 5, 2009)* as it relates to urban storm water and agricultural phosphorus issues. This report is located at:

http://www.michigan.gov/documents/deq/sagbayphosrep_283289_7.pdf

At the end of this chapter are the recommendations and discussions from the Agricultural Phosphorus Work Group and the Stormwater Phosphorus Work Group from the above-mentioned report, which should be considered as action items for the watershed.

Impairment – Pesticides & Herbicides

Description:

Pesticides and herbicides are used to prevent or destroy pests or nuisance weeds to prevent either damage by the insects or pests or competition by weeds for soil nutrients and moisture. These chemicals are used in urban residential settings or in agriculture areas.

Sources:

The predominant source by volume of pesticides and herbicides is agriculture in this watershed. Usually it is under managed conditions and applied by trained applicators as more agricultural practitioners outsource this type of work because of regulations. However, urbanized utilization of the same chemicals is not regulated as stringently unless the homeowner is using a lawn service for applications. If done by the homeowner, the application could be improper because of information deficits. Another source is municipal or private operations of large turf grass areas such as parks, cemeteries, athletic fields and other large areas of turf grass that exist in the watershed. Other urban applications are in commercial and business districts for the landscaping in those areas.

Causes:

Improper applications or calibration of equipment are in the main causes of herbicide/pesticide dosing in the watershed. Pesticides/herbicides are also subject to leaching into the groundwater and entering surface water. If misapplied in the urban setting or when a precipitation event is imminent, the chemicals can become a slug load in storm water runoff and, if near a storm water conveyance system, can enter the river in a short time of concentration.

Priorities:

Pesticides/herbicides are a medium priority as far as affects upon aquatic life, fisheries and wildlife. However, in relationship to partial and total body contact recreation, they are a low priority.

Goals:

- Restore and protect surface water for aquatic life and wildlife in the watershed
- Restore and protect surface water for partial and total body recreational contact

Objectives:

- Increase knowledge about pesticide and herbicide application and usage for both agricultural and urban residents
- Increase the use of buffer strips to prevent misapplication too close to surface water; these buffer strips can either be vegetated or a known width or marked zone of non-application near surface water or storm water conveyance system
- Implement BMPs such as those for LID and infiltration/vegetated bio-systems

Impairment – Loss of Habitat

Description:

The restoration and protection of habitat in watershed is a very important concern for the health of the entire system. The Kawkawlin watershed had an extensive system of wetlands in the pre-settlement era; most of those wetlands have disappeared, or rather changed land use. When looking at the wetland study conducted by the DNRE for this project, the wetland footprint in the watershed is significantly reduced and fragmented. Many of the functions of the wetlands have been lost or significantly diminished. The change in land use has changed the morphology of the environment. The loss of aquatic habitat for warmwater fisheries throughout the system is also a major concern.

Sources:

The stakeholder group and subcommittees have all identified the land use changes from forests to agriculture then the subsequent urbanization and increase in impervious surfaces as a source of the loss of habitats both for wetland and aquatic. The establishment of drainage systems had a significant effect on the reduction and fragmentation of the watersheds wetlands and their functions.

Causes:

Practices of farming to the edge of drains, streams and close to the river has resulted in the loss of habitat and connectivity of natural areas in some parts of the watershed. The drains were constructed to drain wetlands to develop more nutrient-rich land for farming. Maintenance of these drainage systems is important to the new land use for the watershed and the subsequent removal of sediment loads can be looked upon as a loss of aquatic habitat. However, this activity needs to be viewed in a new concept. The excessive nutrient and sediment loads in these drains may not actually be good quality aquatic

environments for macroinvertebrates. Farming in the low level floodplain (areas where recurrence flood intervals is high) is also causing loss of habitat in the proximal areas of the river system. The agricultural areas near the river are also becoming prime home lots and this is also creating habitat loss. Those who want a view of the river in the more forested areas may clear trees thereby affecting the canopy cover over surface water increasing water temperatures. The canopy, understory and woody debris help maintain a healthy aquatic system.

Priorities:

The loss of wetlands, their fragmentation and the loss of habitat is a high priority for wildlife and aquatic habitat. Aquatic habitat for the warmwater fisheries is considered to be a medium priority in the watershed.

Goals:

- Restore and protect wetland areas in the watershed especially those designated areas from the landscape level wetland assessment
- Restore and protect surface waters of all branches of the river and its stream tributaries for the warmwater fisheries
- Restore and protect floodplain areas of the riparian corridor

Objectives:

- Develop and implement a program for a net gain of wetlands in those areas defined in the wetland study for potential wetland restoration
- Establish a program for conservation easements in the watershed
- Educate the public on the need for conservation easements to protect lands and green ways in the watershed
- Utilize new drain maintenance techniques to enhance aquatic habitat (two stage channel development with sinuosity)
- Develop and implement innovative vegetated buffer strip programs to enhance habitat along riparian areas of drains and tributaries
- Stabilize river banks using innovative “green armoring” techniques to prevent erosion and loss of riverine and aquatic habitat
- Develop overstory in areas of the watershed that are lacking such areas.
- Assess or target poor macroinvertebrate study areas for restoration techniques to improve habitat
- Educate the public on Stream Volunteer Monitoring programs and develop a group of volunteers to monitor sites in the Kawkawlin watershed
- Implement Adopt a Stream programs to help improve aquatic habitat
- Educate the public on aquatic habitat and wetland functions

Impairment – Low Water Flow / Altered Hydrology

Description:

In low water flow conditions in rivers and streams, the flow is minimal or depth is minimal for a functioning aquatic system. Therefore, the aquatic habitat and macroinvertebrates, amphibians and fish become threatened or prone to low oxygen

conditions. Altered hydrology has many variables that affect it; weather is one of the unpredictable aspects of it. However, steps to inspire groundwater recharge in the watershed or enhance wetland storage of runoff may help improve base flows in the watershed.

Sources:

Low water flow conditions are dependent on many factors such as weather, the water cycle and other variables beyond control of humans. Altered hydrology by increased impervious surfaces in the lower Main Branch or runoff from agricultural fields in the North and South branch of the river can create flow disparity. Also, riverine areas where a single channel suddenly becomes three or more channel branches can create low flow conditions as the flow of one channel now is divided into channels with similar cross sectional areas.

Causes:

Low water flows can be caused by split flows as described above where one channel now feeds three similar sized channels. Low water levels in the Great Lakes have an effect on the river system. The reverse flow conditions experienced in the Main and South Branch of the river can have an effect on flows and water depth in the river. Additionally, in low flow situations, warm weather can cause water temperature increases especially in the agricultural drain areas which then discharge into the river and will increase water temperatures. Altered hydrology can contribute to flooding conditions in portions of the North Branch near the confluence and other areas.

Priorities:

Low flow/altered hydrology conditions can threaten fisheries by creating conditions for low DO and creating fish kill conditions or a threat to other aquatic organisms; so it is a high priority. These low flow conditions can also create a high priority for navigation on the Main Branch and interfere with future potential use of the other branches for recreational boating. Altered hydrology can contribute to flooding conditions in specific reaches and is a high priority on the lower reach of the North Branch of the river.

Goals:

- Restore base flow to the maximum extent practicable
- Restore and protect surface water as a warmwater fishery
- Restore and protect surface water for navigation
- Protect areas prone to flooding.

Objectives:

- Implement drain maintenance BMPs to assist with stream flows
- Implement overstory strategies to protect river and river banks
- Implement understory strategies to protect river and banks
- Implement strategies to improve infiltration of groundwater from runoff to improve base flow for longer periods of time.
- Improve flow in lower reach of the North Branch to prevent flooding in that area

Impairment – Invasive Species

Description:

Competition in the watershed habitat for native species from invasive species is becoming widespread. The native species are being subdued by many of the invasive species. These invasive species most of the time do not have an established natural predation to keep them in check and can aggressively compete with natives for niche spaces, food, nutrients or sunlight in the environment. Sometimes the invasive species will feed on native species eggs, interfere with reproduction or can simply reproduce faster and more often than the native species.

For example, the round goby is a bottom-dwelling fish that has great potential for causing impacts on Great Lakes fisheries. Originally, the round goby was introduced into the St. Claire River in 1990, probably via contaminated ballast water of transoceanic ships. It is thriving in Saginaw Bay. They are aggressive, voracious feeders and can take over prime spawning sites traditionally used by native species, competing with native fish for habitat. The goby can also survive in degraded water conditions and spawn more often and over a longer period than native fish. Unfortunately, they have shown a rapid range of expansion through the Great Lakes.

Others were described in Chapter 3, such as phragmites, canary grass, purple loosestrife, zebra mussels and others.

Sources:

Round goby, phragmites, purple loosestrife, zebra mussels, others.

Causes:

The round goby and zebra mussels were introduced from ballast waters of ocean going freighters, and Bay City had international shipping traffic up until the 1980s when American Brownhoist ceased operations.

Phragmites and canary grass have become common place in the coastal wetlands of Saginaw Bay and are in the drains of Bay County and the watershed of the Kawkawlin.

Priorities:

Control and elimination of invasive species is a high priority to protect the warmwater fisheries and aquatic habitat of the Kawkawlin Watershed.

Goals:

- Restore and protect surface waters for warmwater fisheries
- Restore and protect wetland, stream, drain, and river habitat from invasive plants
- Restore and protect coastal river inlets to Saginaw Bay from invasive plants

Objectives:

- Implement phragmites eradication programs in the watershed as quick as possible
- Eradicate phragmites and other invasive plants during drain maintenance projects
- Educate the public on invasive species and how to identify and report their presence in areas not yet infested to begin early elimination of species
- Minimize the spread of zebra mussels and gobies
- Develop programs for elimination of invasive species such as boat inspections, certified bait stations and other innovative methods

Impairment – Public Access Sites

Description:

Access to surface waters of the Kawkawlin is important for recreational usage and, with increased usage more of the public will appreciate and protect the water resource.

Sources:

Limited or no public access sites on the South and North Branch of the Kawkawlin River.

Causes:

Almost all land along the Kawkawlin is private property. Access sites need to be located near roads and there are not many public road access points on either branch.

Priorities:

Recreational access and navigation of the Kawkawlin is a low priority at this time. As the other river restoration problems are assessed, this may rise in priority as people wish to access and use the river system.

Goal:

- Improve or enhance access to the Kawkawlin River's North and South Branches for recreational use

Objectives:

- Develop a plan and implement a “green” river trail system for paddlers and kayakers
- DNRE or township recreation plans to develop access points on either conservation easements or through property acquisitions
- Educate the public on water trails to build interest in project.

Impairment – Trash and Debris

Description:

The accumulation of trash and debris can create problems with aesthetics of the watershed and can block or diverts the flow of surface water. When riverbank trees' root systems erode and fall into the river, they create logjams and collect other floating debris. Floatables, litter and trash is thrown away by irresponsible people. With the interstate highway system and other county roads at a few locations, trash is a product of passing vehicles with trailers, open box trucks, etc. losing cargo or people just throwing out litter.

In rural areas drains, tributary streams and river crossings are used as disposal sites for construction materials, “white” appliances, furniture, scrap materials and other large items people do not wish to pay for disposal or cannot afford to pay for disposal. In urban areas, people will take their large items to the rural areas to “drop” off into drains.

Sources:

Dumping of trash in rural drains has been observed in most watersheds especially in the wooded areas where visibility is limited. Once used, the dumping seems to escalate. When runoff events occur, these channel blockages can create sites for erosion. Logjams from tree falls create channel blockages and navigation hindrances. These were noted at numerous locations in the recent aerial photos and are documented with GPS locations for assessment and removal. In the upper reaches of the North Branch, nature may produce blockages by beaver dams; these need to be assessed by DNRE staff.

Causes:

If ordinances are not enforced preventing illicit dumping of trash, some areas can become a literal dump site. Moderate or severe bank erosion can cause trees to fall into the river. Wind storms can also quickly dump many trees into the river and form impenetrable blockages to navigation and flow. These trees, when they fall into the river, can be a source of bank erosion and bed erosion. Beaver dams are naturally occurring and each needs to be assessed for suitability to the environment at their location. Most river obstructions are not removed because of property issues and responsibility issues.

Priorities:

Trash dumping and debris are a high priority for ensuring navigable surface waters. The removal of trash and debris is a high priority for improving the aquatic habitat.

Goal:

- Restore and protect aquatic environment
- Restore and protect surface water navigation

Objectives:

- Remove trees and log jams from the navigational channel to improve aquatic habitat
- Implement green bank armoring BMPs to prevent erosion

- Monitor overstory and understory to prevent bank erosion
- Remove trash and illicit dumping of materials from river, stream or drain crossings or other locations as needed
- Develop and implement Stream Cleanup programs
- Apply for Stream Clean up Grants
- Educate the public on problems caused by illicit dumping
- Establish “No Dumping” sites at identified sites
- Promote trash pick up of large items (Note: this may not be a problem now with higher metal recycling payments.)
- Identify debris removal sites on a three-year plan basis by low level flights and high resolution aerial photography
- Develop a “hotline” to report dumping violations

Impairment – Petroleum products, brine, deicers, metals

Description:

Petroleum products, deicers and metals are byproducts of our country's transportation system and are found in large quantities of first flush storm water runoff events. Brine is a source of chemicals for the region's chemical industry. There are wells throughout the region along with old pipelines. Petroleum products can also be introduced to the river from old wells and their transport pipe systems.

Sources:

The transportation systems are one source of these products. However, the runoff from impervious surfaces carries a substantial amount of petroleum byproducts, heavy metals, deicers and other materials to the storm water systems and ultimately the river. Petroleum can also come from the abandoned oil field pipelines that cross the Kawkawlin River at various locations.

Causes:

Runoff from impervious surfaces can impair storm water quality during runoff events. The use of LID BMPs can improve water quality. The pipeline crossings can cause leakage of petroleum into the river if they fail or are struck by a motorized boat or farm implements.

Priorities:

Removal of oil pipelines is a high priority for aquatic habitat protection in the watershed. Addressing brine, heavy metals and deicers is a high priority for protection of warmwater fisheries and aquatic habitat. Removal of pipelines is a high priority for navigation.

Goals:

- Identify owners and remove oil pipeline crossings from river and banks
- Restore and protect aquatic environment from first flush pollutants listed above

Objectives:

- Identify locations of all petroleum pipeline crossings
- Implement a plan to remove all petroleum pipeline crossings
- Use LID BMPs to address first flush runoff for water quality
- Implement BMPs to address first flush in post construction controls in all NPDES communities in the watershed
- Educate public on use of deicers

Recommendations and Discussions from the *Saginaw Bay Coastal Initiative Phosphorus Committee Report (June 5, 2009)*:

From the Agricultural Phosphorus Pollution Prevention Work Group are the following recommendations that are listed within cropping and within livestock in priority order:

Definitions:

BMP – Best Management Practice

CAFO – Concentrated Animal Feeding Operation: as defined by EPA

CNMP – Comprehensive Nutrient Management Plan

GAAMP – Generally Accepted Agricultural Management Practice

Hobby Farm – non-commercial operations (ex.: not for profit or those operations not filing Schedule F Federal tax return)

MAEAP – Michigan Agriculture Environmental Assurance Program

MDA – Michigan Department of Agriculture

MFB – Michigan Farm Bureau

MSUE – Michigan State University Extension

NPDES – National Pollutant Discharge Elimination System

NRCS – Natural Resource Conservation Service

Small and medium size farm – commercial operation less than CAFO size

USDA – United States Department of Agriculture

Cropping Systems

- 1. Develop consistent nutrient recommendations specific to the Saginaw Bay area supported and promoted by all groups providing direction for farmers.**

Discussion: Currently, groups providing support for farmers on nutrient recommendations are not presenting a consistent message. Nutrient recommendations need to be updated specific to crops grown in the Saginaw Bay area, providing a consistent message to farmers regarding fertilizer application.

- 2. Provide incentives to promote on-farm conservation demonstrations in cooperation with producers and agribusinesses.**

Discussion: Funding this recommendation encourages agribusinesses to develop a conservation partnership and jointly support a program to conduct on-farm demonstrations.

Conducting on-farm comparisons of management practices is one of the most effective ways to convince producers to adopt management changes. It is important that conservation messages come to producers from a partnership of key business community stakeholders, for example implement dealers, agronomy consultants, lenders, commodity groups, etc.

3. Promote cover crops for control of wind erosion; allow more flexibility to adapt other wind erosion control practices to match specific site conditions.

Discussion: Wind erosion is a significant source of sediment containing phosphorus to the Saginaw Bay. A MDNR 1988 study estimated wind erosion resulted in greater than five million metric tons of the soil erosion, accounting for 63% of the total soil erosion in the Saginaw Bay Basin. Cover crops provide the best protection against wind erosion and should be promoted.

Other options to address wind erosion (such as wind breaks and filter strips) should be evaluated. The funding agencies, such as USDA, NRCS, conservation districts, etc., should have practices with more flexibility for site-specific conditions leading to wider adoption.

4. Purchase and maintain research farms in the Saginaw Bay area to demonstrate various management practices and evaluate their effectiveness under different cropping systems.

Discussion: Since the early 1990's, MSU Extension, Huron Conservation District and Tuscola Conservation District, in cooperation with area farmers, have successfully conducted demonstration research plots to evaluate the benefits of various conservation practices and cropping management systems. This research has been funded through grants and has had a positive impact encouraging conservation tillage in the Saginaw Bay area. The funding sources for demonstration plots are not permanent. This recommendation is to provide funding for the purchase and maintenance of Saginaw Bay area research farms to establish permanent demonstration sites. Research priorities should have local input and oversight.

5. Develop and promote a range of options to achieve a minimum vegetative setback from all drains, creeks, rivers and lakes.

Discussion: Farming to the edge of drainage ways occurs in the Saginaw Bay area. Providing a vegetative setback between the drainage way and the agricultural production area would reduce the likelihood of erosion and overspray from fertilizer and pesticide applications. Current programs promoting these types of practices have requirements that limit the widespread adoption of vegetative setbacks. The funding agencies, such as USDA, NRCS, conservation districts,

etc., should have practices with more flexibility for site-specific conditions leading to wider adoption.

6. Establish the Saginaw Bay area as Michigan's agricultural subsurface tile drainage research area for water quality.

Discussion: The Saginaw Bay area provides a unique research area to study the effect of agricultural tile and drainage on water quality. It is recommended that resources be provided to MSU to establish an agricultural drainage research and education program similar to the University of Minnesota's (<http://www.extension.umn.edu/DrainageOutlet/drainage-science.html>) or The Ohio State University's (<http://www.ag.ohio-state.edu/~agwatmgt/>).

Special note: Insure there are no unlawful septic drain connections to agricultural tile drainage prior to any research.

7. Promote GPS and/or zone soil sampling and testing along with fertilizer application to develop accurate baseline for nutrient levels and apply fertilizers based on this information.

Discussion: This recommendation will reduce input costs for fertilizer by accurately identifying and applying nutrients only where needed. It will reduce P levels by only applying to crops what is necessary to achieve realistic yield goals.

While there can be cost savings to accurately applying fertilizers through means of GPS technology, currently many farmers are concerned about costs associated with GPS soil testing and fertilizer application. Demonstrations and grant funding are needed to offset costs to overcome this barrier for adoption of GPS technology.

8. Demonstrate erosion control best management practices (BMPs) to stabilize temporary v-ditches cut for field drainage.

Discussion: A majority of the Saginaw Bay area soils are poorly drained. Farmers cut v-ditches to drain water from low areas in their fields to the nearest ditch or drain to reduce crop damage. V-ditches are not stabilized and can contribute sediment containing phosphorus directly to nearby waterways. Since v-ditches are temporary measures for storm water relief, the problems encountered are very similar to construction storm water. This recommendation is to demonstrate how construction storm water control practices may reduce the risk of sediment discharges from these temporary v-ditches.

9. Promote innovative, environmentally sound drainage ditch design, construction and maintenance in the Saginaw Bay area. This should be coordinated with the North East District of Michigan County Drain Commissioners (includes: Arenac, Bay, Genesee, Gladwin, Huron, Lapeer, Midland, Saginaw, Sanilac, Shiawassee, St. Clair, and Tuscola counties).

Discussion: Many of the waterways in the Saginaw Bay area are designated county drains established to manage water flow. Design, construction and management of these drains in an environmentally sound way could substantially reduce sediment containing phosphorus into the Saginaw Bay. Current drain law and code do not provide many opportunities to work on water quality projects; however coordination of environmental programs and grants with drain projects can provide a process to accomplish both water quantity and quality management.

Coordination with the North East District of Michigan County Drain Commissioners will provide greater opportunity to develop a strong working partnership between drain commissioners and environmental programs.

Livestock Systems

Small/Medium Size Farms

- 1. Provide funding for Conservation District livestock specialist positions in the Saginaw Bay area to focus on technical assistance to small and medium size livestock operations.**

Discussion: Conservation Districts provide much of the on-farm technical assistance to producers regarding management practices in the Saginaw Bay area. One-on-one assistance with farmers is necessary for implementing best management practices. Conservation District technicians are knowledgeable about the USDA cost share programs and assist farmers with the administrative and technical issues. Additional local technical assistance would result in environmental improvement through greater participation in programs such as the Michigan Agriculture Environmental Assurance Program (MAEAP).

- 2. Develop “common sense” standards and solutions that provide low cost, flexible alternatives to address operational problems.**

Discussion: Often federal and state cost-share programs require more comprehensive and expensive solutions than are necessary to resolve simple problems. While cost-share programs exist to address some of the management issues on the farm, these programs often require a long-term commitment and substantial capital outlay. To receive funding, additional issues beyond the immediate practice must be addressed in conjunction with the desired practice.

Many of these programs have substantial administrative and process oversight (i.e. application, engineering review, etc.) creating a reluctance, including financial obstacles, for many farmers to participate. Comprehensive farm management planning is an excellent concept; however, in order to achieve an immediate environmental improvement, the process must be streamlined to allow for implementation of practical, low-cost practices. Building flexibility into these cost share programs and offering more options would lead to a greater acceptance and implementation by producers.

3. **Promote the simple message “No runoff – No discharge” through an outreach program targeted to non-permitted (NPDES) small and medium size livestock operations.**

Discussion: Small and medium size livestock farms have diverse operations and management practices. Some of the challenges identified are as follows: age of farmer (pending retirement and not willing to adopt best management practices); storage (expensive for small/medium operations); and short-term timeframe to recapture costs associated with improvements. A simple message, “No runoff – No discharge,” should be universally and consistently promoted by all agencies and organizations. The intent is to establish a minimum implementation level for every livestock farm operation in the Saginaw Bay area.

4. **Identify non-traditional approaches to conduct educational outreach to small and medium size livestock operations.**

Discussion: Because of the diversity in management approaches on small and medium size operations, it is difficult to develop a standard educational outreach program with wide appeal.

Traditional approaches have had limited effectiveness. To attain broader acceptance and implementation of best management practices, it will be necessary to identify, implement, and evaluate non-traditional approaches.

Hobby Farms

5. **Develop a summary report of local ordinances related to livestock within the Saginaw Bay area to provide information and education on existing local ordinances and the Right to Farm Act.**

Discussion: Local ordinances exist to regulate the number of livestock a landowner can have per the area owned. Many residents are not familiar with these ordinances. Ordinances and their enforcement vary between governmental units. The Right to Farm Act preempts any local ordinance, regulation or resolution that purports to extend or revise in any manner the provisions of this act or generally accepted agricultural and management practices developed under this act. A grant should be utilized to support an education/outreach program on nutrient management, targeting hobby/small livestock facilities in the Saginaw Bay area.

6. **Develop an outreach and education program targeting hobby farms regarding appropriate manure management practices and utilization.**

Discussion: In field surveys of area watersheds, hobby farms, particularly farms with only a few animals, have discharges as a result of poor manure management practices. Hobby farms have very different operational needs than production livestock operations. Recognizing hobby farms as a specific target group and

promoting sound manure management practices to them should effectively address a majority of these discharges. MDA and MSU Extension are implementing outreach and education programs to these types of farms, and coordination with their efforts will provide a good initiation point for a more intensive regional effort. An example of such a program is the Huron County's "Horse Sense – 2009 Equine Workshop" that was offered in Bad Axe in the fall of 2009.

Concentrated Animal Feeding Operations

7. Farms accepting manifested manure should have a nutrient management plan with appropriate setbacks; identification of environmentally sensitive areas; and application timing.

Discussion: CAFOs generally manifest a majority of their manure to land owners for application to nearby fields. A NPDES CAFO permit requires a Comprehensive Nutrient Management Plan (CNMP) to outline how and where they will apply manure. Proper land application of manifested manure, including appropriate setbacks; identification of environmentally sensitive areas; and application timing, etc., is not required to be documented. To provide reasonable assurance to the surrounding community, farms accepting manifested manure should develop and implement nutrient management plans that minimize discharge and runoff.

8. Develop an education and certification program for manure applicators, specifically targeting the individuals directly applying manure to the fields.

Discussion: Many custom applicators receive training and continuing education; however, employees directly applying manure to fields do not receive sufficient training to ensure that manure application aligns with the recommendations in a CNMP or NMP. Training employees is essential to provide environmentally sound manure application. A training program should be developed for the manure applicators and their employees providing a basic awareness of discharge and runoff issues.

9. Promote farms that have implemented sound environmental practices which positively contribute to the surrounding community.

Discussion: Many farm operations properly manage their manure and have invested in their facilities to achieve sound environmental standards. These positive efforts should be recognized and promoted within the agricultural and local community. It is important to acknowledge that, like other businesses, farms provide jobs and contribute to the local economy.

Manure Utilization

10. Promote the value and alternative uses of manure.

Discussion: Manure is becoming much more valuable. Due to the increase in cost of commercial fertilizer, the value of manure has become similar to a commodity. Ensuring that this message is promoted and alternative use options are made readily accessible will provide for better management of manure. Utilization of manure value calculators are available at:

<http://animalagteam.msu.edu/LandApplication/ManureValueCalculators/tabid/250/Default.aspx>.

11. Update regulations regarding waste management to incorporate “green” technologies.

Discussion: Waste management regulations were originally developed primarily to address industrial waste streams. Regulations should be re-evaluated to determine how to actively support green technologies, such as anaerobic digesters and composting facilities using comingled waste. A workgroup should be formed to draft recommended changes to waste management laws that will encourage green technologies.

12. Support the Huron Economic Development Council’s efforts at developing regional anaerobic digesters for manure and other wastes.

Discussion: Several years ago, the Huron County Economic Development Corporation (EDC) began to evaluate how they could assist our agricultural industry in economic development projects. One key area that they began to explore was the development of alternative energy related to farms and agriculture. The EDC focused on anaerobic digesters for several reasons.

First the basic technology is well understood. Second, there is a significant amount of feedstock, (i.e. manure) for the digesters. Third, digesters could address several issues related to manure and nutrient management on our local farms. The EDC conducted a base line study of several farms in the area, the Lusk Study, to determine implementation issues. The report indicated that digesters could have an impact on farms but the payback was not quick and the farms were not interested in owning and managing what is basically an alternative energy company. The EDC has continued to pursue this track but focused on a large scale, "community" digester that could include several farms and other feedstocks. This has been a long term effort for the EDC.

Currently the EDC is reviewing the qualifications of and interviewing several companies that could be interested in developing a state of the art, community digester in Huron County. The successful company will then begin the process of developing an anaerobic digester, (community scale), meeting with local farms, determining DEQ permitting requirements and utilization of final products. It is

anticipated that this process will take 6-8 months ending with the site selection of the digester, all of the required permits, contracts with farms for feedstock, up take contracts for electricity and natural gas and off take solutions for the digested manure.

13. Develop a commercial composting facility for bodies of dead animals and manure in the Saginaw Bay area.

Discussion: Currently there are extremely limited ways to dispose of bodies of dead animals.

In the Saginaw Bay area, no landfills accept bodies of dead animals, no rendering options are available, and burial during winter months is not practical. Current legislation does not allow for the co-mingling of bodies of dead animals or manure. Composting is a beneficial way of utilizing various waste streams. Dead animals, both livestock and road kill, pose a hazard when improperly disposed. A commercial composting facility would allow livestock owners to properly dispose of dead animals and manure.

14. Support a link for a Saginaw Bay area manure brokering website.

Potentially expand the existing MSU Extension website:

<http://web2.canr.msu.edu/manure/>

Discussion: Provide farmers access to information about where they can buy and/or sell manure. MSU Extension has established a manure brokering website that could be tailored for expanded use in the Saginaw Bay area.

15. Evaluate the Genesee Power model for horse and other manures and explore expanding local collection points.

Discussion: Genesee Power is currently taking horse manure from area farms to convert to energy. Investigating this model may provide another option to address manure utilization in the Saginaw Bay area.

Livestock Exclusion

16. Promote a consistent, simple message “Keep livestock out of waterways.”

Discussion: Keeping livestock out of the water is the best way to ensure there is minimal sediment, nutrient, or fecal discharges from these animals into the nearby streams, creeks, drains, rivers, and lakes. A brochure *Acceptable Practices for Managing Livestock Along Lakes, Streams, and Wetlands*, compiled by MDEQ; MDA; MSU Extension; and the United States Department of Agriculture (USDA), NRCS is a resource for information. MSUE Bulletin No. E-3066.

Phosphorus Feed Management

17. Promote the use of a mass balance approach for including phosphorus in livestock diets.

Discussion: Phosphorus is one of the most expensive supplemented mineral in livestock feeds. Most grains used in animal diets (corn, wheat, soybeans) store as much as 80-90% of the total P in the form which is unavailable for uptake by swine (monogastric digestive systems).

Use of phytase, a commercially available enzyme, in monogastric diets increases the availability of phytate-bound P, reducing the need for supplemental inorganic P, and resulting in a reduced total P load in manure. We encourage the use of phytase in swine diets and support continued research that allows for the improvement of P utilization among livestock. Additionally, with drastic increases in input costs for livestock producers, many require utilizing co-products, such as distiller's grain, in livestock feeds. Some of these co-products contain concentrated amounts of P. Livestock producers need to eliminate additional sources of P in the diet to minimize the amount of P being excreted in manure. We support educational and research efforts that help producers and nutritionists include the minimum amount of P necessary into livestock diets.

Storm Water Phosphorus Workgroup

This workgroup identified three key areas where actions may result in significant reductions in phosphorus loads to the Kawkawlin Watershed and ultimately the Saginaw Bay, they are: Septic Systems; Low Impact Development; and Improvements in Stormwater Regulations. Their recommendations and discussions follow and are considered as action items for the Kawkawlin Watershed.

Septic Systems

If properly designed and maintained septic systems provide an excellent way to treat wastewater. However, where septic systems are inadequately designed or maintained discharges from these systems can contribute phosphorus and bacteria to nearby streams and lakes. In order to ensure appropriate oversight and functioning of these systems, the following actions are proposed:

- 1. Education** – Many people view septic systems as wastewater disposal instead of wastewater treatment. It is important to educate homeowners on how septic systems work and how to properly maintain them.
 - Establish outreach program utilizing readily available resources targeted to homeowners
- 2. Data Management** – Septic systems have been used for wastewater treatment in the United States since the 1880s. The permitting system in Michigan for septic systems was standardized in the 1970s. There are many septic systems that were installed prior to this permitting process and therefore are not effectively tracked. Additionally, as the permitting process and sanitary codes developed, information

collected for the design and construction of these systems changed leading to variation in available information.

It is critical that information collection and retrieval be standardized, comprehensive, and easily accessible. The recommendations below will help to establish this process:

- Resolution recommending a specific data management system to standardize on statewide basis
- Demonstrate value of selected data management system to other counties in the Saginaw Bay Watershed through the Kawkawlin River Watershed project

3. Develop model local ordinance – A model local ordinance should be developed to achieve standard level of septic system inspections and maintenance and create resolution to encourage counties in the

Saginaw Bay Watershed to adopt it. Sanitary codes in other surrounding counties will be reviewed to evaluate existing provisions. A matrix of this information will be developed to assist in developing the model code. The following issues will be evaluated for possible inclusion in the ordinance:

- Point-of-Sale Inspections - Inspections mandated by LHDs or the local governing body at the time of home sale have been established in a number of counties statewide. (In general, a point of sale approach is opposed by realtors, but would have general support of LHDs if promulgated with flexibility.)
- Change In Use Inspections - As a condition of issuance of a building permit for modifications to an existing home, some LHD jurisdictions require a review of the existing on-site wastewater system by the LHD (The overall average frequency of inspection resulting from this approach is unknown.)
- Mandatory Inspection/Reporting at the Time of Maintenance Event - Statute requiring the inspection/reporting at the time of pumping of the septic tank or other maintenance event would result in inspection of a significant number of systems (This general approach has been implemented as part of the state of Wisconsin administrative code along with a requirement that all systems be inspected for evidence of surface ponding every 3 years and that newly permitted systems include a management plan.)
- Alternative System Guidance – identify a central site(s) for common guidance on alternative systems
- System age – Systems over a certain age (25 years) should be required to have a regular inspection
- Dwellings without approved permit – Existing dwellings without an approved septic system permit should be required to have an inspection
- Onsite sewage treatment language – Need to change onsite disposal to onsite treatment in ordinance to reflect the need for ongoing maintenance
- Annual Septic System Community Report – An annual report should be required to report on the effectiveness of onsite sewage treatment throughout the community

4. Financing – One of the critical challenges to effectively addressing septic system problems is providing access to funding for homeowners and municipalities. While funding sources are available for much of this work currently, the actions below are recommended to make this funding more easily accessible:

- Low interest loans – Outline local program that would provide zero to low interest loans to homeowners. Need to establish clear technical and financial criteria
- Evaluate State and/or local funding (loan/grant) for addressing septic system issues
- Resolution to support local programs and/or modifications to State funding programs to address septic system issues

5. Partnerships – While the County Health Departments provide the principal oversight of septic systems, other local agencies and organizations play a critical role in assisting the Health Departments in identifying and correcting failing systems.

It is recommended that partnerships be established between local Health Departments and other local agencies and organizations, and that a model inter-agency process to identify and address septic system failures be developed.

Partners would include:

- Drain Commission
- Road Commission
- Local Townships and Municipalities (including planning commissions, building departments, and local elected officials)
- Realtors
- Homeowners Associations
- Home builders Associations

Low Impact Development (LID)

Low Impact Development (LID) is an innovative storm water management approach with a basic principle that is modeled after nature: manage rainfall at the source using uniformly distributed decentralized micro-scale controls. LID's goal is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. Techniques are based on the premise that storm water management should not be seen as storm water disposal. Instead of conveying and managing/treating storm water in large, costly end-of-pipe facilities located at the bottom of drainage areas, LID addresses storm water through small, cost-effective landscape features located at the lot level. These landscape features, known as Best Management Practices (BMPs), are the building blocks of LID. Almost all components of the urban environment have the potential to serve as a BMP. This includes not only open space, but also rooftops, streetscapes, parking lots, sidewalks, and medians. LID is a versatile approach that can be applied equally well to new development, urban retrofits, and redevelopment/revitalization projects.

The following recommendations outline actions in the Saginaw Bay Coastal Area to promote the implementation of LID:

1. Promote LID Best Management Practices (BMPs) Manual and the Filling the Gaps manual developed for Michigan.

- Provide a conduit of communication to professional designers, planners, municipalities, counties and other agencies in a position to implement this manual in the region

2. Combined Sewer Overflow (CSO)/Low Impact Design (LID) Drainage district grant project.

- Completion of grant project and release of results
- Support the public education portion of this project

3. Provide a model LID ordinance with a resolution to adopt the ordinance.

- Remove obstacles for Low Impact Design in the region
- Review existing ordinances in the country and state to develop a model ordinance
- Meet with regional, county and municipal planners to determine implementation strategy for Saginaw Bay Region
- Provide educational opportunities for planning commissions to introduce the LID concept in order to facilitate change

4. Develop LID Outreach Strategy

- Develop strategic partnerships with professional regional, state and national organizations to promote LID (Landscape contractors, Michigan Nursery Landscape Association, Turfgrass Association, Professional Associations, MSU Cooperative Extension)
- Focus Groups for Landscape Architects, Design Engineers, Construction Contractors, Landscape Contractors and lawn / landscape maintenance professionals
- Education for review agencies, planners, planning commissions, and engineers to help them understand LID concepts and how to review site plans that are implementing LID in their communities: how not to be a roadblock to change but to be a change agent to implement this type of development
- Facilitate education sessions for focus groups
- Interaction with local watershed groups, storm water authorities and municipalities to promote LID
- Promote tours to show examples of local LID projects and their impact on water quality
- Promote use of signage on LID projects in the Saginaw Bay Regions
- Provide education for review process of commercial development, plats, condominium projects and industrial sites

5. Incentives for LID – Promotional piece

- Develop a list of grants that are available for use as incentives

- Research and make available information on grants for use in LID projects

Storm Water Regulations

Storm Water regulations in Michigan provide a framework for how municipalities, commercial entities, and construction sites can reduce storm water pollution. While these regulations provide a starting point for pollution reductions, the following recommendations outline actions that will enhance and improve implementation of these regulations:

1. Funding

- Street Sweeping – provide guidance and resources for improved street sweeping equipment
- Catch Basin Cleaning – provide additional resources to clean catch basins on a more frequent basis
- Sustainable Funding – Evaluate various sustainable funding options to implement storm water regulatory requirements

2. Education

- Litter Removal – provide local education program on appropriate disposal of grass and leaf litter
- Public Outreach – Increase public education on storm water issues related to phosphorus control targeting television and radio
- Catch Basin Signage – Implement programs designed to mark catch basins with environmental message (e.g. Don't Dump Here ... Flows to Saginaw Bay)

3. Authority

- Spills - Expand local authority and resources to address spills
- Storm water Ordinance – Evaluate the legal authority to pass storm water ordinances at the County level
- Drain Code - Modify Chapter 21 & 22 of the Drain Code to allow assessment for Water Quality improvements
- Non-MS4 Communities – Evaluate the authority to allow non-MS4 communities to regulate and fund a storm water program under the MS4 regulations
- Phosphorus Ordinances – Encourage the development and passage of zero-P phosphorus ordinances in the Saginaw Bay Watershed Counties and municipalities

4. Effectiveness

- MS4 Regulations - Evaluate the effectiveness and challenges of implementing the MS4 regulations in the Saginaw Bay Area as it relates to phosphorus
- Common Sense Approach - Establish a storm water regulatory review committee including regulated communities to develop a “common sense” approach to implementing MS4 requirements